A Search for Phyllosilicates Near the Lunar South Pole

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The Clementine bistatic radar experiment observed strong signals within 5^o latitude of the lunar south pole suggesting that ice could be trapped in the 16000 km^2 permanently-shadowed region (Nozette et al. ,LPSC, 1996). Theoretical studies (e.g., Ingersoll et al., Icarus, 1992) suggest that water ice could exist in permanently shadowed regions on the moon near the poles extending to +/- 76.5^o latitude. We decided to investigate the possibility of the interaction of liquid H_2O with surrounding rock by looking for the spectral signature shown by some phyllosilicates, products of the aqueous alteration process, near the lunar south pole. We modeled the transmission curves of spectra of 20 asteroids. Ten of these spectra are of C-class asteroids showing the 0.7μm absorption feature attributed to Fe^{2+} -> Fe^{3+} in oxidized iron in phyllosilicates present in 50% of existing C-class asteroid spectra. The other ten included asteroids of S, C, D, P, and unusual classes showing a variety of absroption features. An algorithm was designed to differentiate between the Galileo filter photometry of those asteroids having spectra that show the 0.7-μm feature and those that do not. Telescopic spectra of various lunar sites were also examined. None of these lunar spectra showed any 0.7-μm absorption feature. Images from the Galileo Lunmap 14 image suite (Gaddis et al., JGR 100, 1995) taken with the GRN, RED, 756-nm and 889-nm filters were coregistered for an area covering -84^o to -60^o latitude, near 90^oW longitude. This area was chosen as an area where the spatial resolution was sufficient to correlate data accurately among the different images, and where areas that both have and have not undergone aqueous alteration could be expected. The results of the application of the algorithm for detecting the 0.7-μm feature will be presented.

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